ZH->ee bb

James Heinmiller
12MAY05
Higgs Worshop

Outline

Dataset
Event Selection
Areas of improvement
Electron distributions
Z distributions
Jet distributions
Future plans

Datasets

Data

Pass 2 EM1TRK skim 336.8 1/pb includes to the end of V12

MC – Pass 2

Z->ee +X	400,000 events
Zjj->ee + jj	291,000
Zb->ee + b	101,750
Zbb->ee +bb	98,000
tt->2l + bb	49,500
Wjj->e + jj	133,776
ZZ->inclusive	53,500
ZH->ee + bb mass=125	5,000
Z->tau+tau	403,000

Area of improvement - move to V13 dataset

All Athenalized using p16-br-03 jes 5.3

Event Selection

Data

Remove events with bad luminosity block numbers – Cal,CFT,Jet/Met, and SMT

Remove events with bad run numbers

Remove duplicate events

Individual EM object must pass L1&L2&L3 trigger

E1_SH30 | E1_SHT20 | E2_SHT20 | E3_SHT20
E1_SH30 | E1_SHT20 | E2_SHT20
E1_SH30 | E1_SHT20
E1_SHT20
EM_HI_SH | EM_HI_2EM5_SH
EM_HI_SH
EM_HI
EM_MX_SH
EM_MX

Primary Vertex < 60.0 cm

For MC - only Primary Vertex<60.0cm

Event Selection continued

<u>EM objects</u>

| detector eta | <= 1.1

emf > 0.90

iso < 0.15

Hmatrix7 < 0.12

pt > 25

$75 < M_{ee} < 105$

<u>Jet objects</u>

| detector eta | <= 2.5

0.05 < emf < 0.95

hotf < 10

n90>1

chf < 0.40

Level 1 confirmation > 0.40 CC and FWD >0.20 ICR

Pt>20

$\Delta R > 0.40$ between jet and electron from the Z

Brief selection cuts and Scale Factors

All distributions are 75.0 < Z inv mass < 105 GeV
and 2 jets

MC corrections

Electrons

Pt smeared
SF for pT, eta, and phi from electron reco eff
SF for track eff
Trigger efficiency

Jets

Additional smear to data resolution
SF from jet reco eff
Have not applied SF for taggability
Have not applied SF for jlip b tagger

Areas of Improvement - Electrons

We could add the likelihood cut.

Currently are only using electrons in the central region | detector eta | < 1.1

We could expand to allow one EM object with | detector eta | < 2.5 or both out in the EC.

Electrons	Z+ N jets	Z+ 2 jets	Z+2 taggable	Z+1 jlip 4%	Z+2jlip 4%
CC only	13907	219	156	27	2
CC+EC	26973	379	269	45	3
Increase	1.94	1.73	1.72	1.67	1.5

Concerns

Moving out to the EC we should modify the selection cuts – Hmatrix8

Recalculate the Trigger and EM ID*Reco Eff

Other possibilities of gaining more statistics

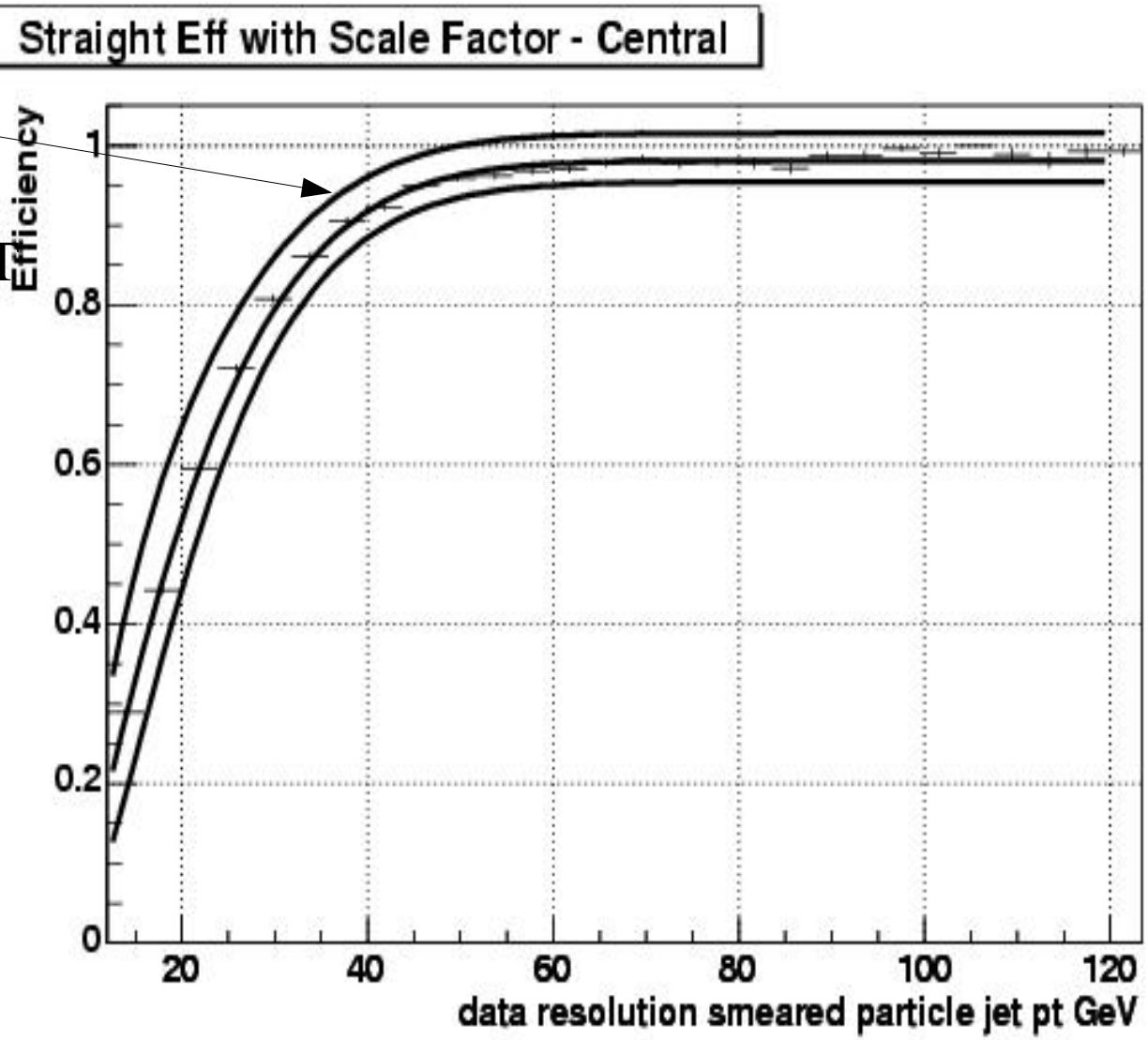
Loosening the Hmatrix7 cut

Areas of Improvement – Jets

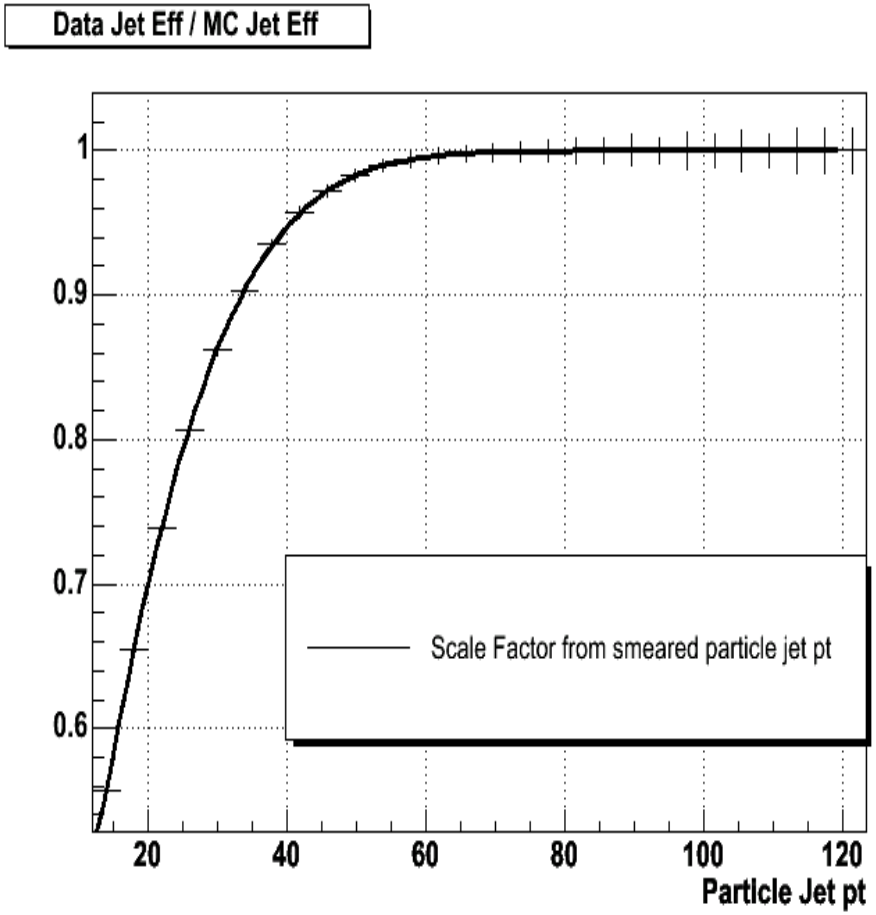
Low jet reconstruction efficiency until 40 GeV

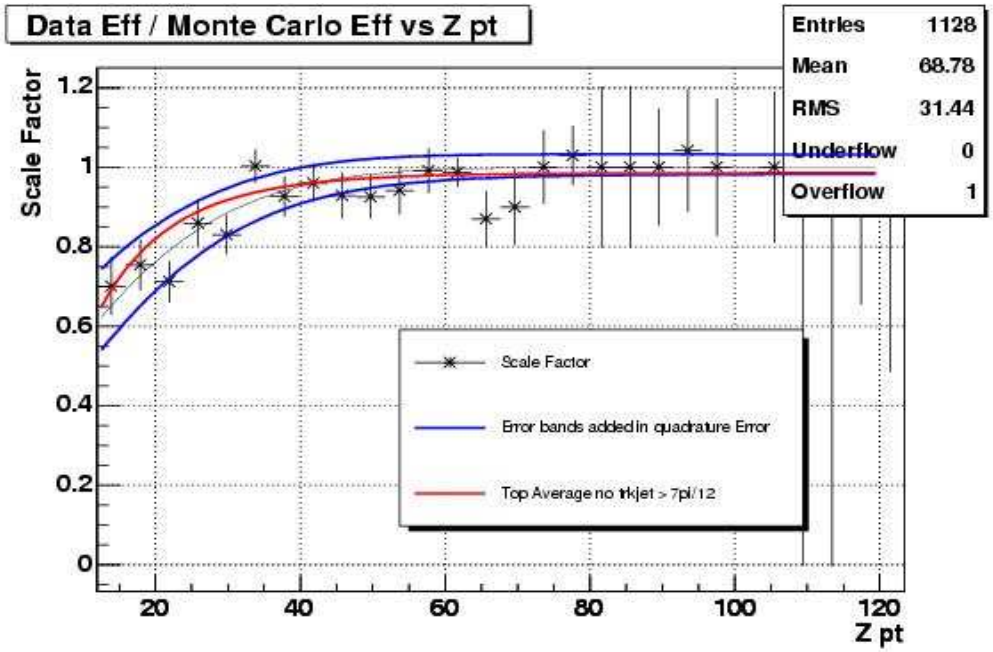
P17 will have 6.0 Min ET which will raise this efficiency

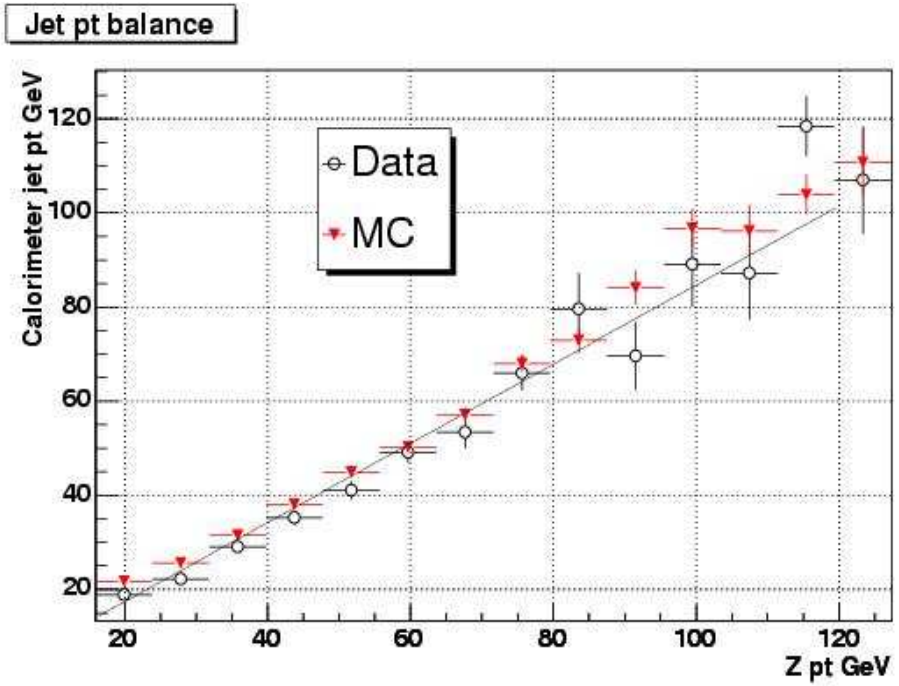
Improved jet resolutions and JES will raise the efficiency



Jet Scale Factor

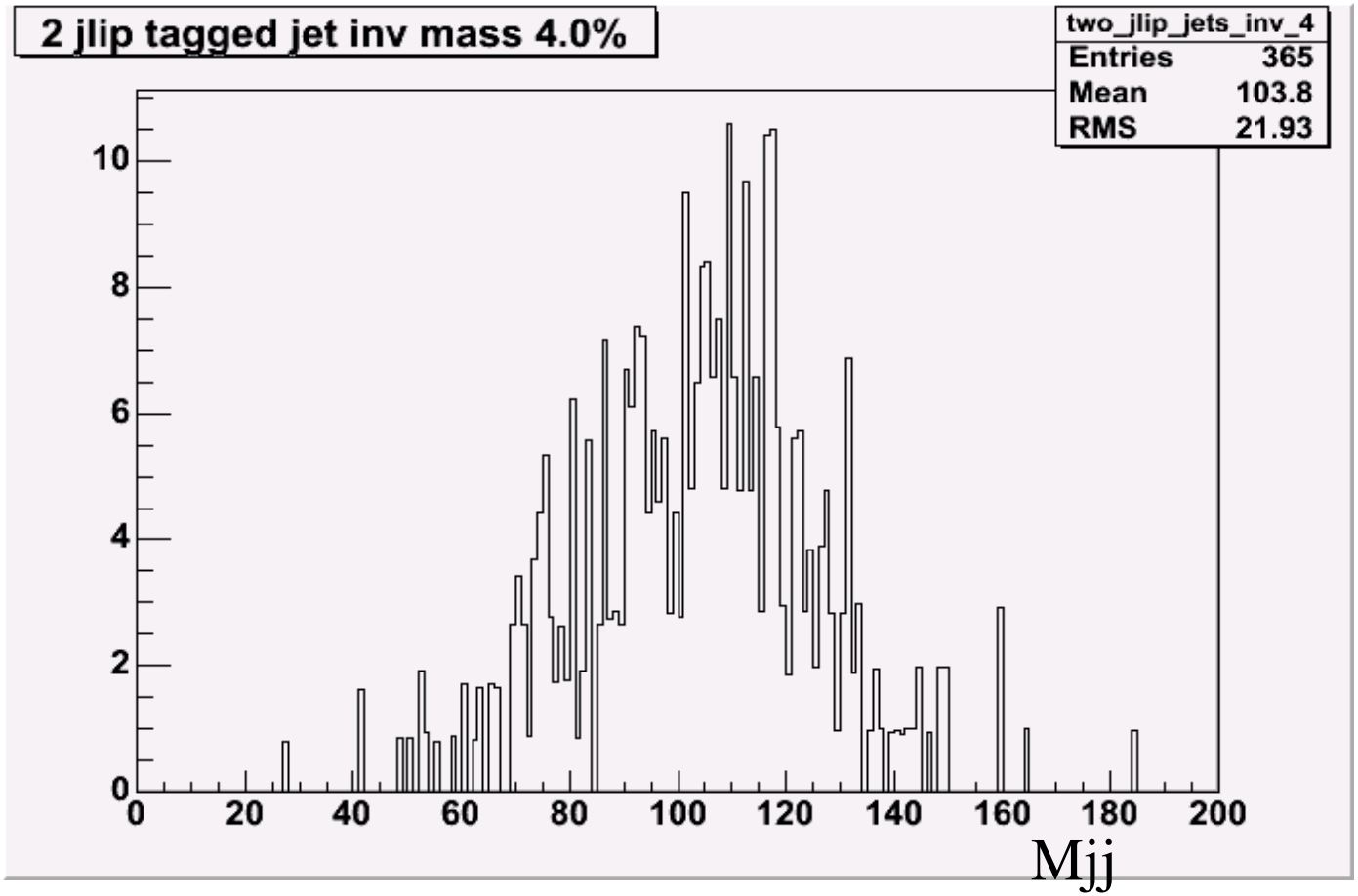






B jet resolutions

ZH->ee_bb higgs mass = 125 GeV



b radiation – the peak has shifted to ~ 104 GeV with a large width

Jet Cone of 0.70 would pick up more energy

Cut Flow

Electrons	Z+ 2 jets	Z+2 taggable	Z+1 jlip 1%	Z+1 jlip 4%	Z+2jlip 4%
Z bb					
W bb					
TT					
ZZ					
Zb					
Z jj					
ZH – 125					
Expected MC					
Data	219	156		27	2

Next steps

Finish jet reco*id note

Repeat Marc's analysis to estable a baseline

Expand to forward electrons

Measure Z+2 jet cross sections

Z + 1 b tagged cross section

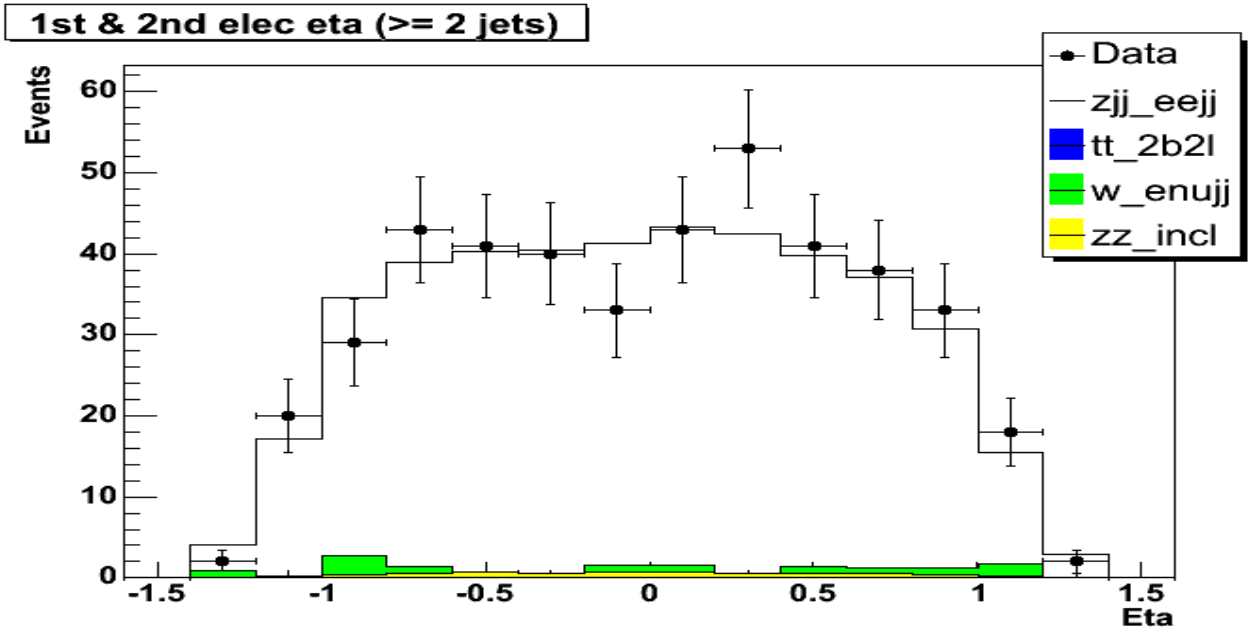
compare to Z+ b jet / Z+ jet analysis

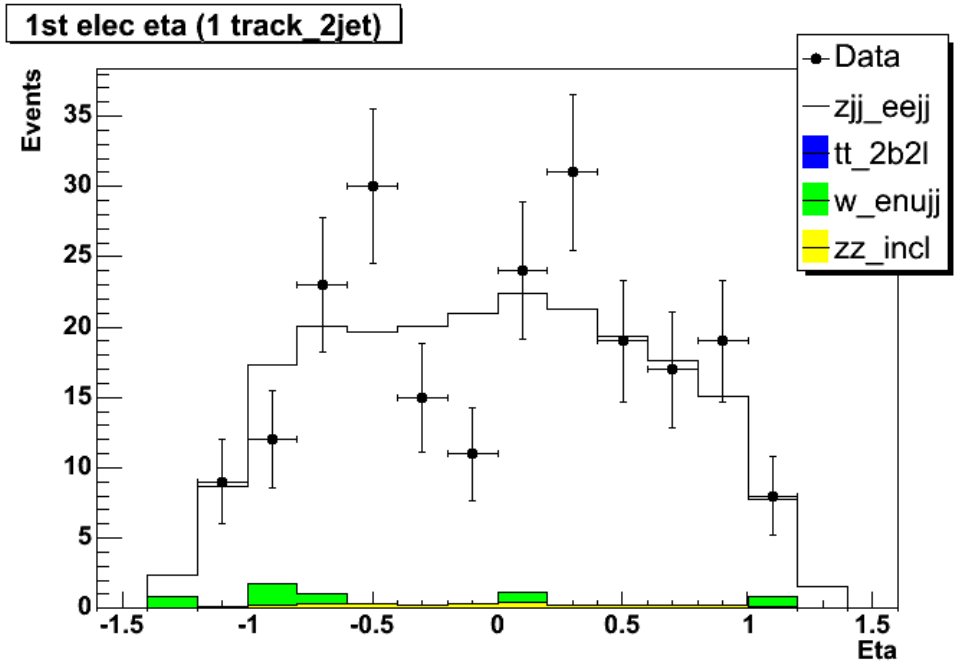
Z + 2 b tagged cross section

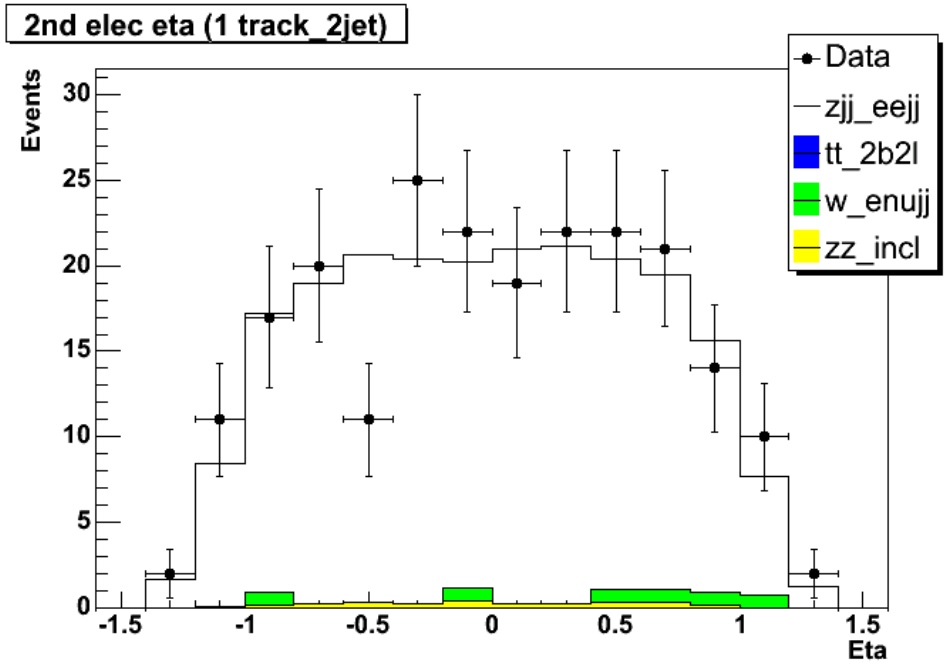
ZH limit

Support Slides

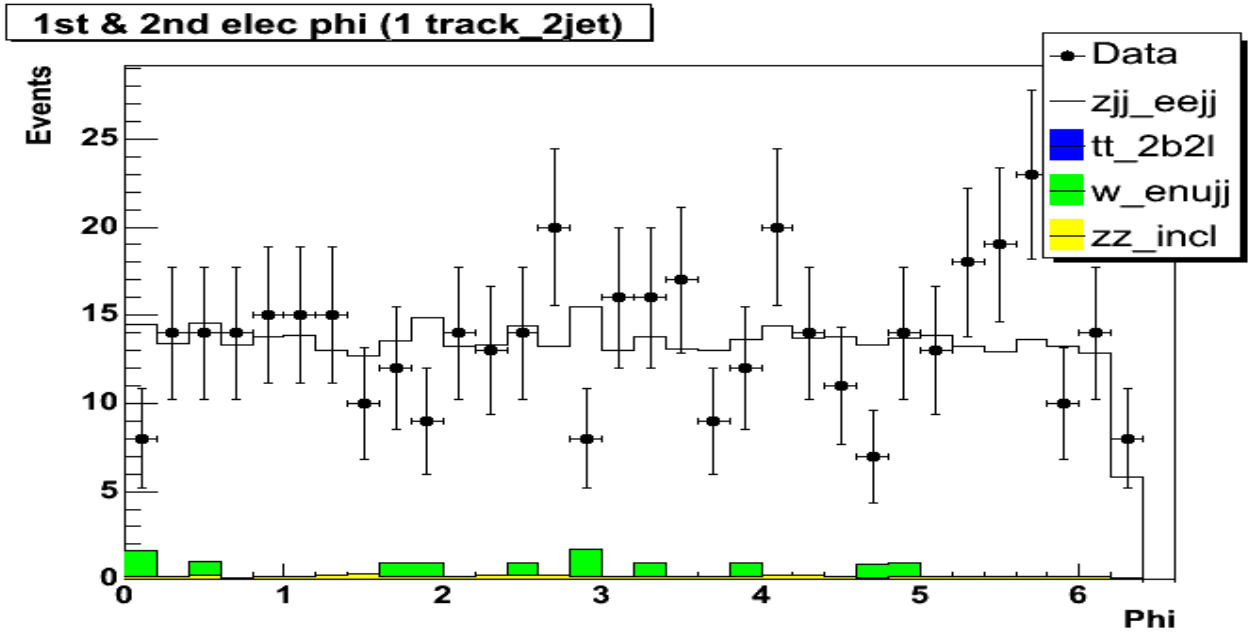
Electrons' Eta

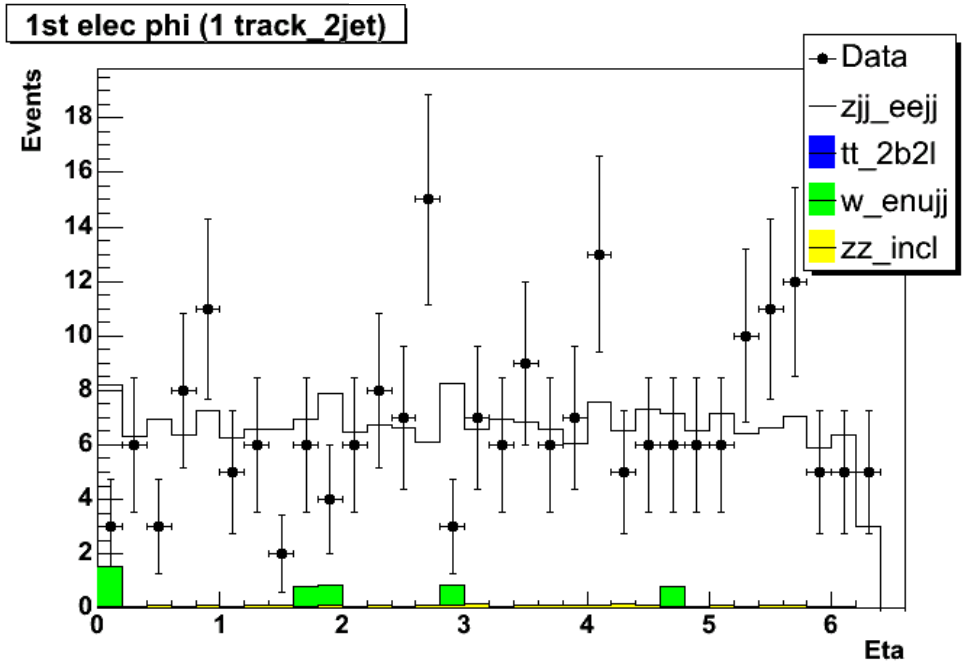


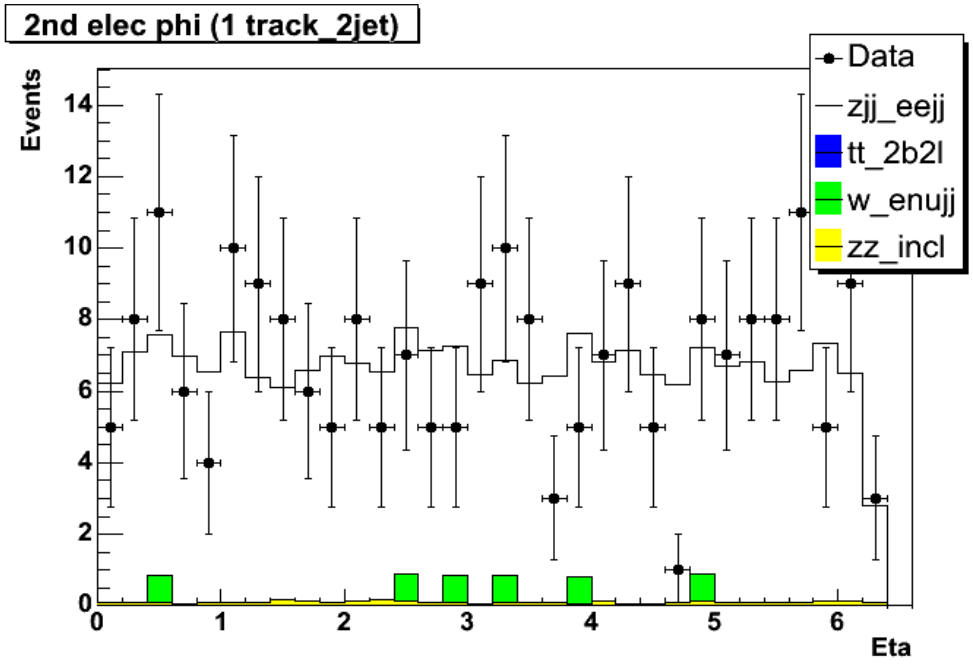




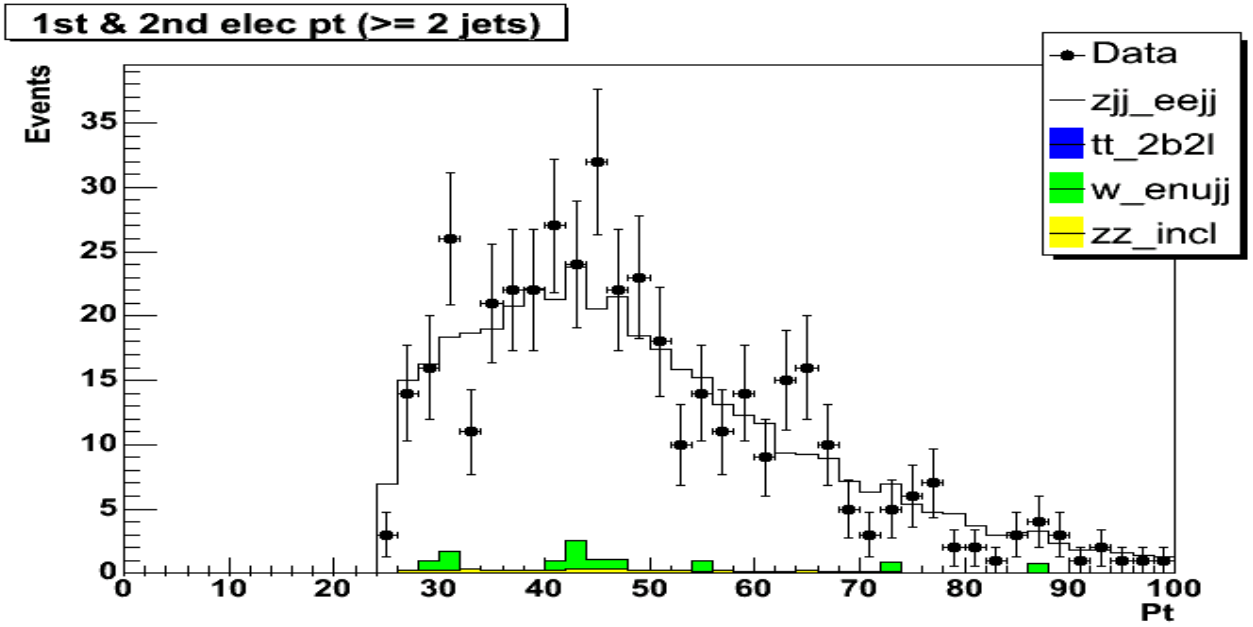
Electrons' phi

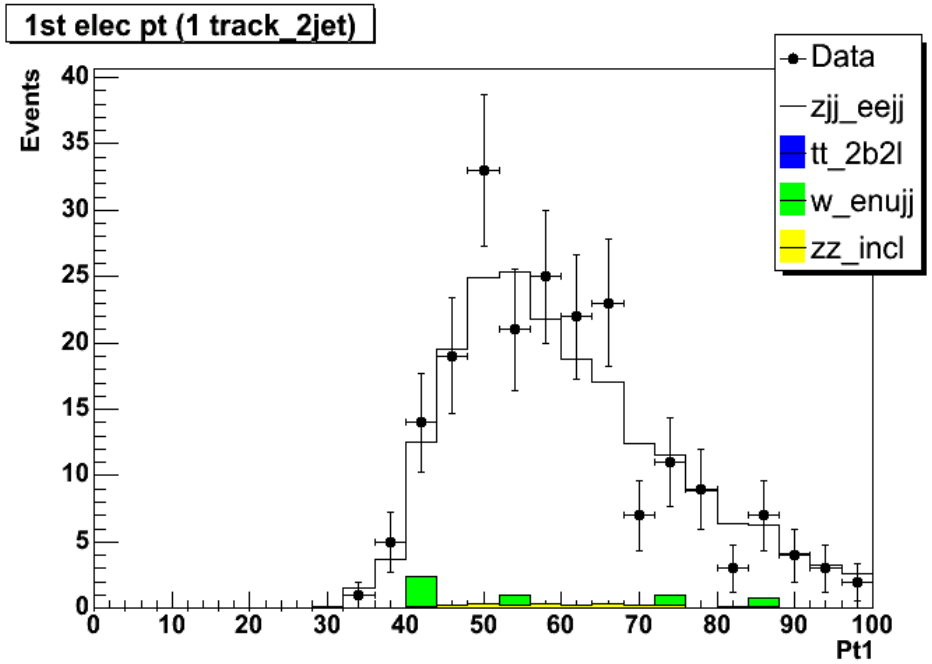


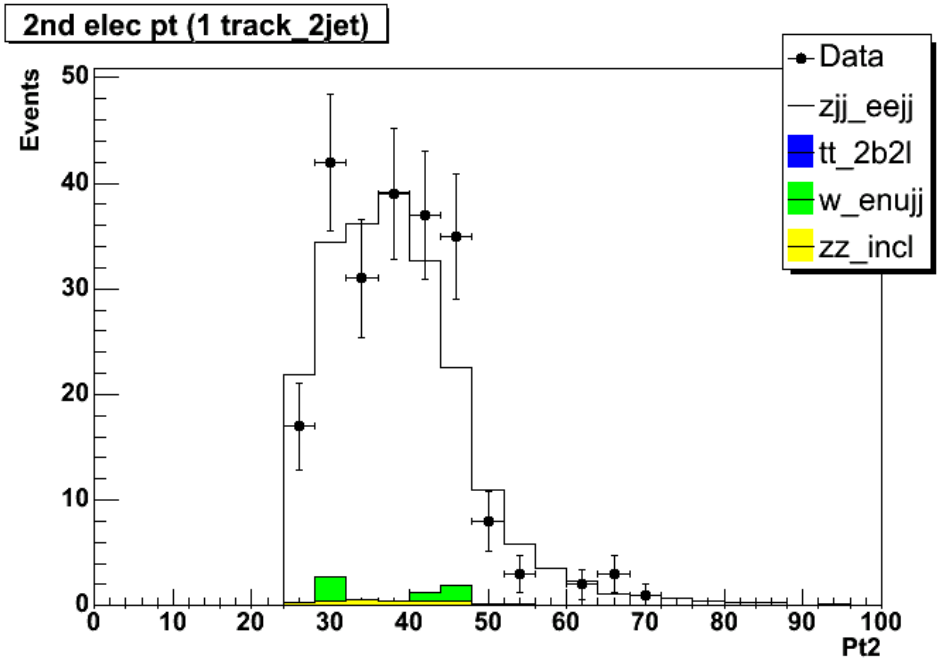




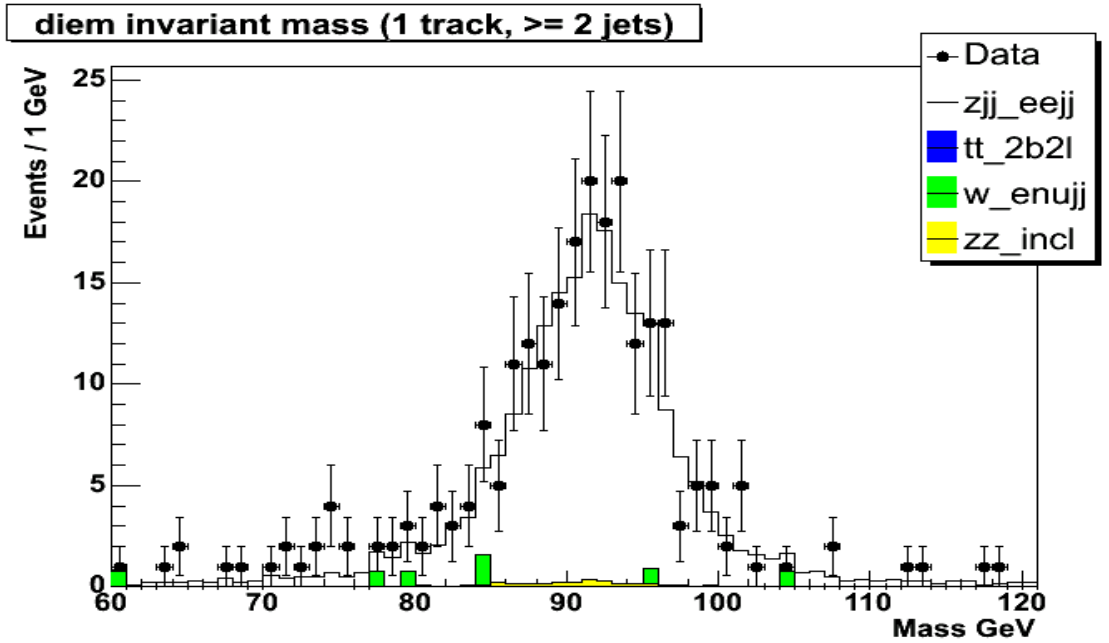
Electrons' pT

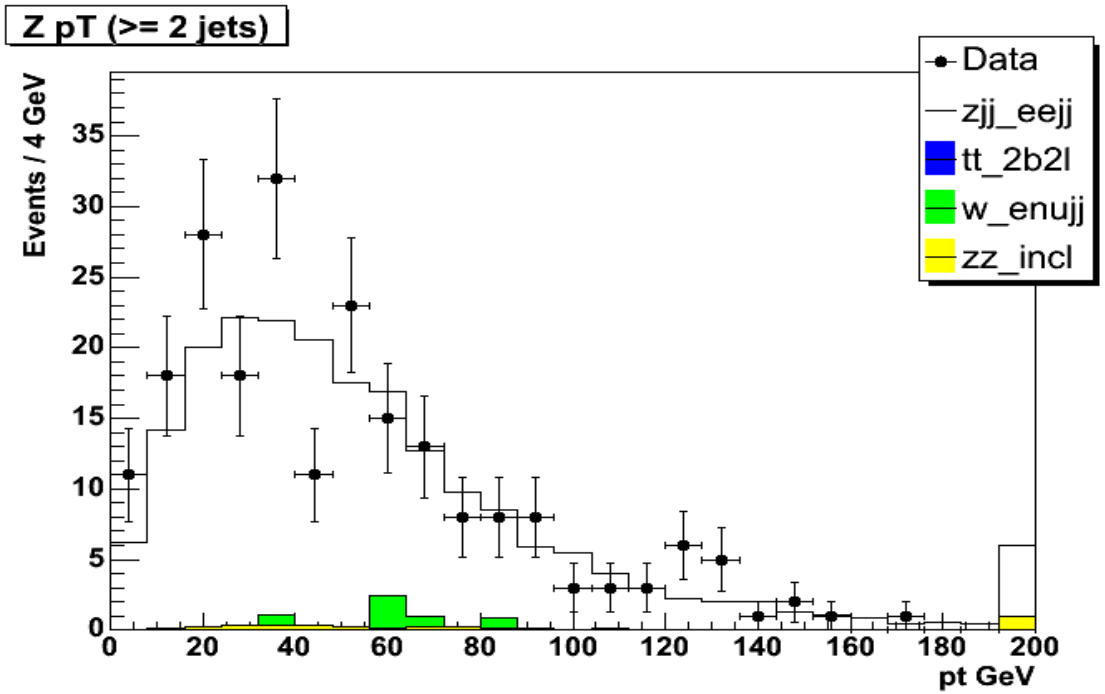




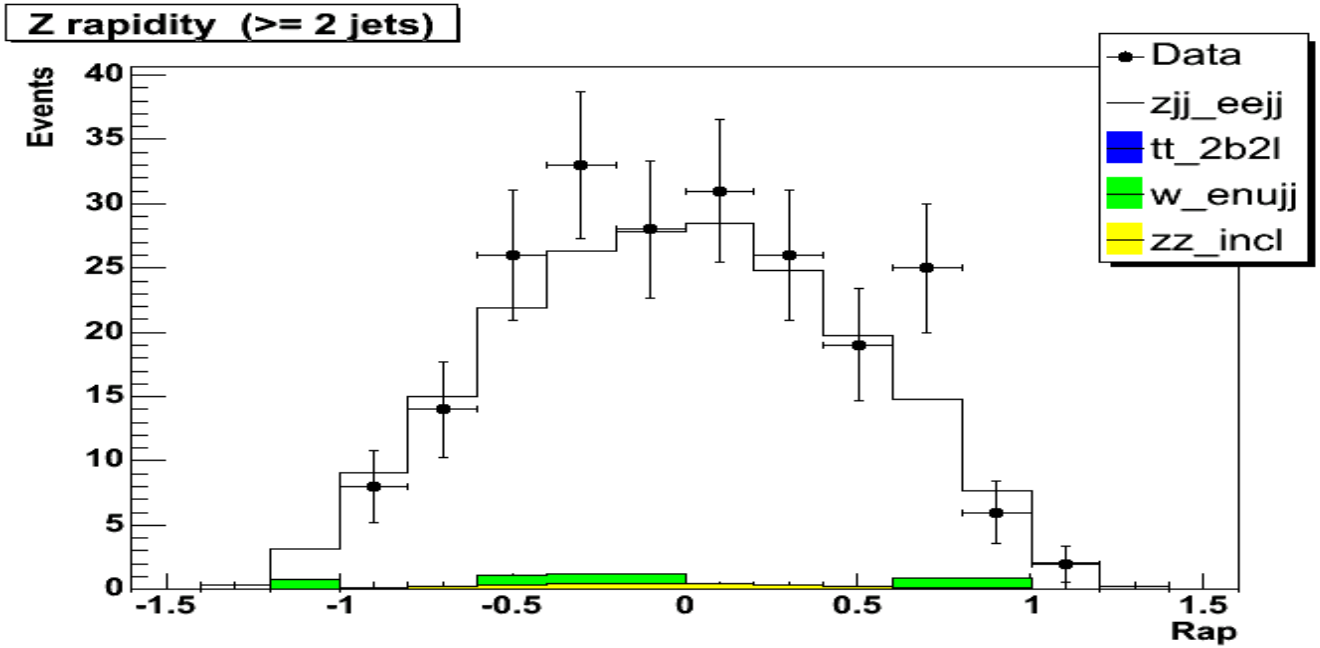


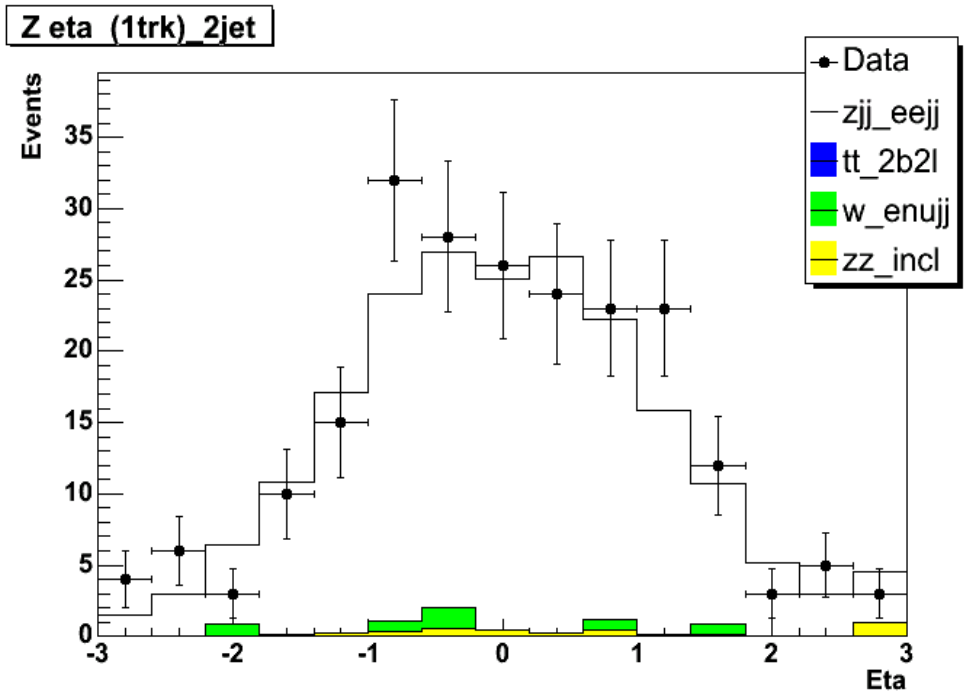
Z Inv Mass and pT

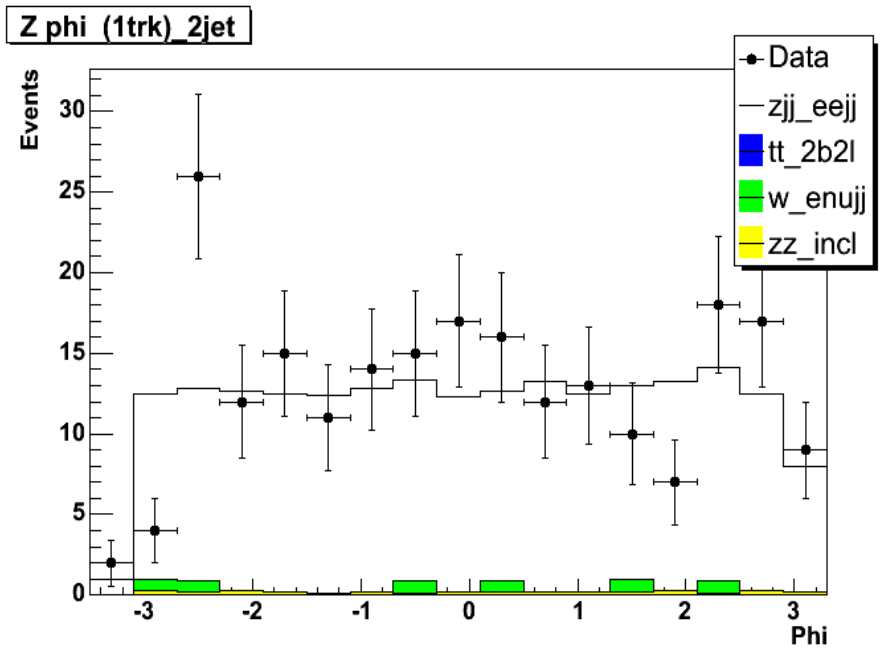




Z Rapidity, eta, and phi





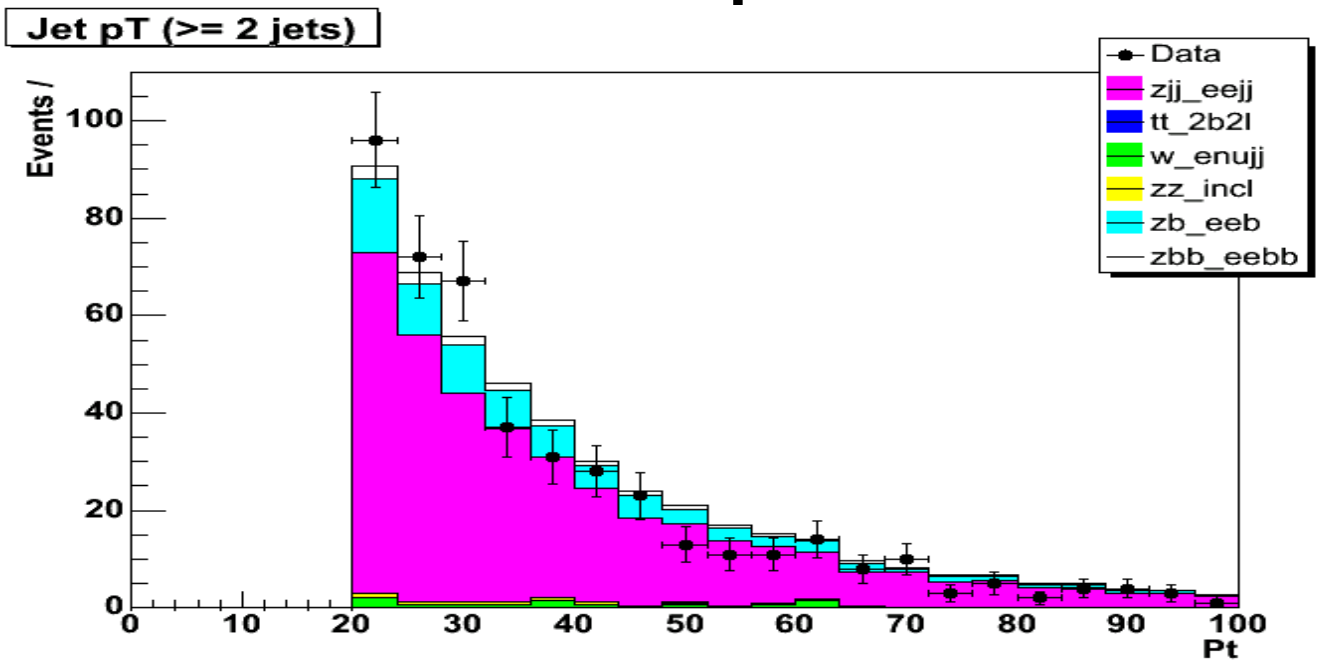


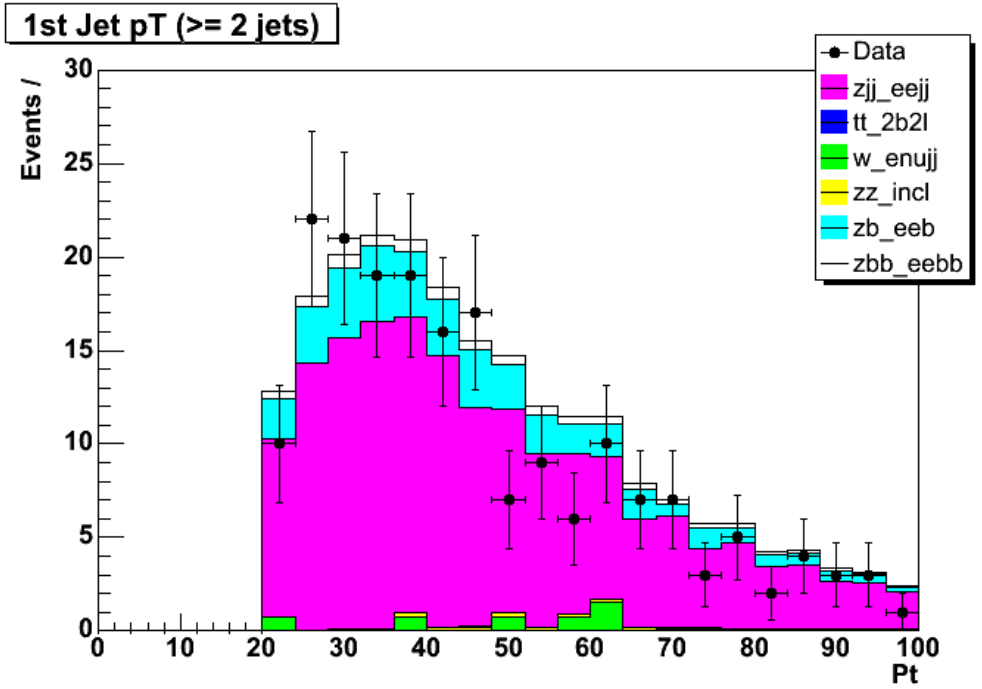
Jet Distributions

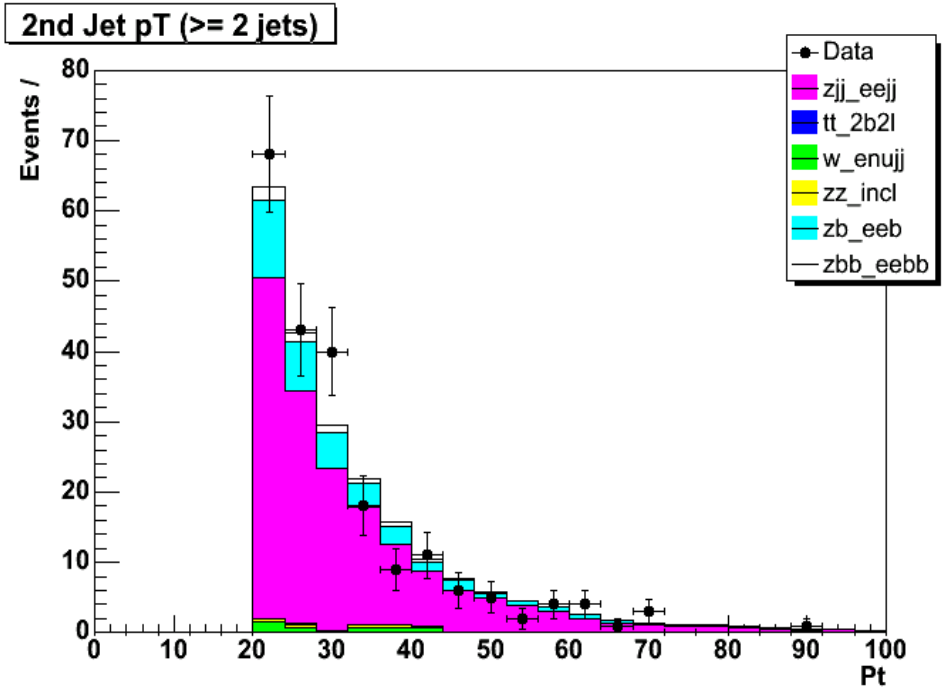
Removed b mesons and baryons from Zjj+eejj

included zb+eeb and zbb+eebb

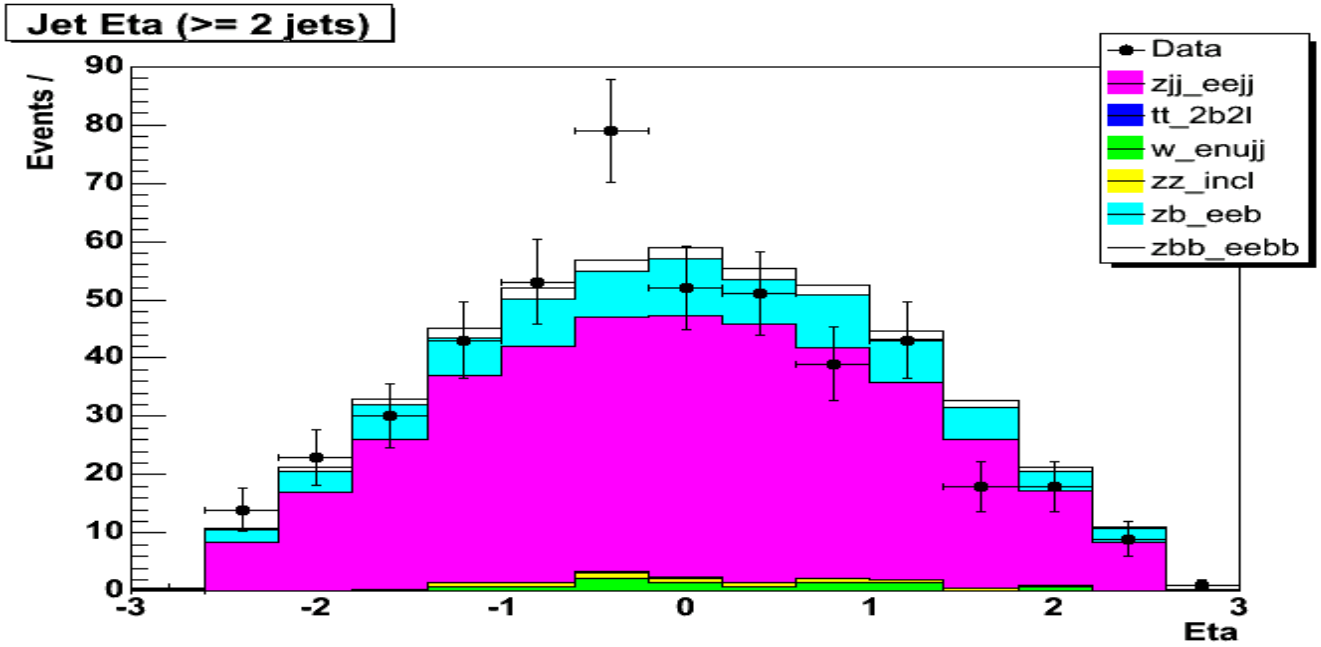
Jet pt

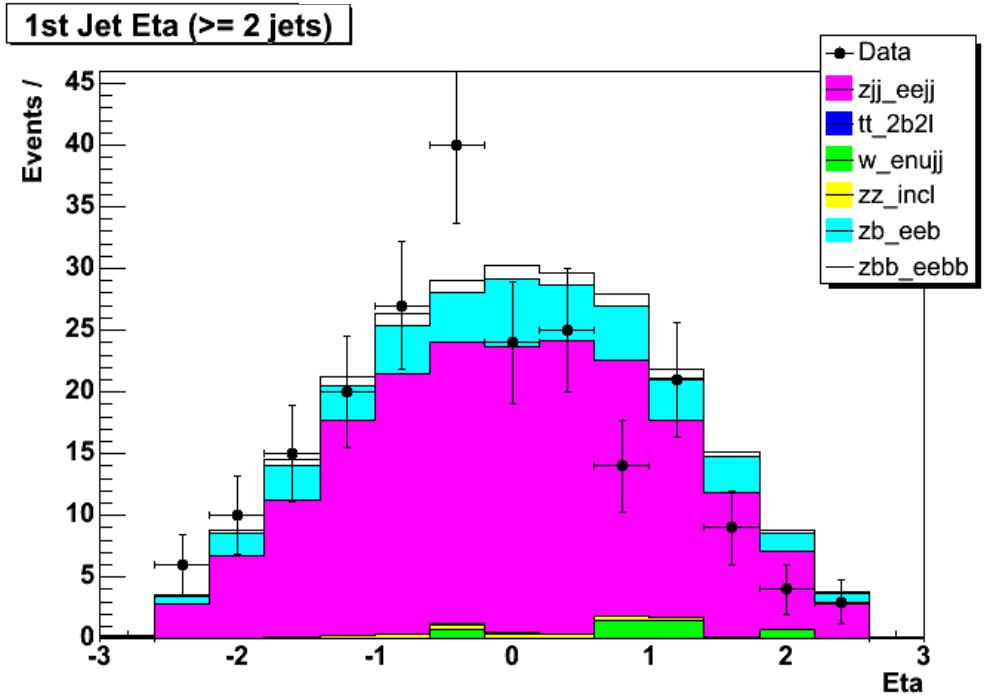

Jet pT (>= 2 jets)
Events /
Pt
Data
zjj_eejj
tt_2b2l
w_enujj
zz_incl
zb_eeb
zbb_eebb

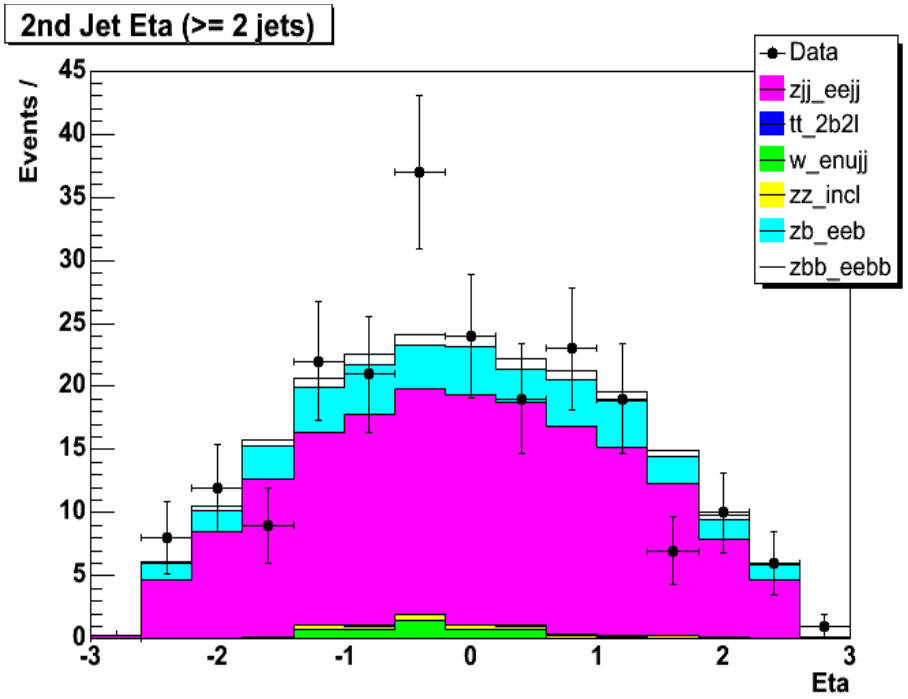

1st Jet pT (>= 2 jets)
Events /
Pt
Data
zjj_eejj
tt_2b2l
w_enujj
zz_incl
zb_eeb
zbb_eebb


2nd Jet pT (>= 2 jets)
Events /
Pt
Data
zjj_eejj
tt_2b2l
w_enujj
zz_incl
zb_eeb
zbb_eebb

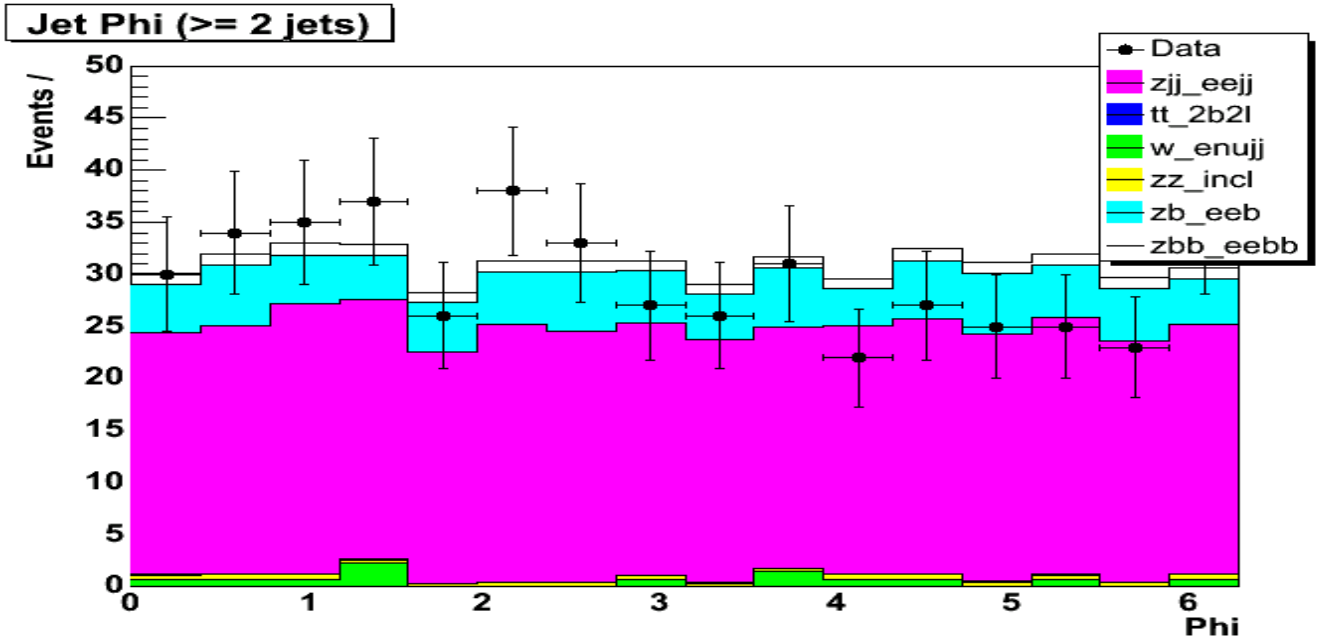
Jet Eta

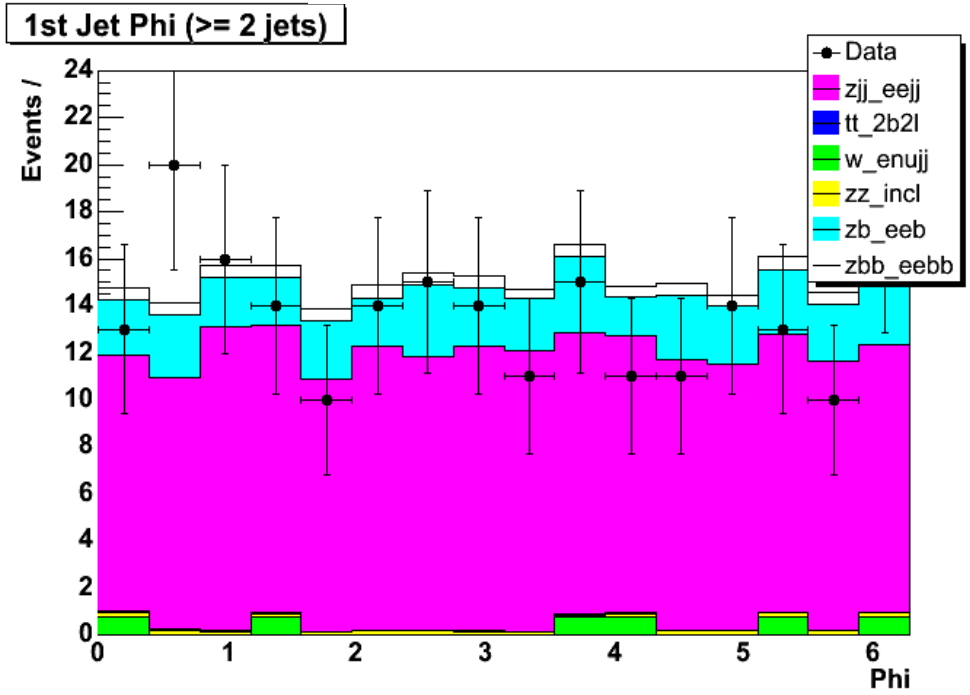

Jet Eta (>= 2 jets)
Events /
Eta
Data
zjj_eejj
tt_2b2l
w_enujj
zz_incl
zb_eeb
zbb_eebb

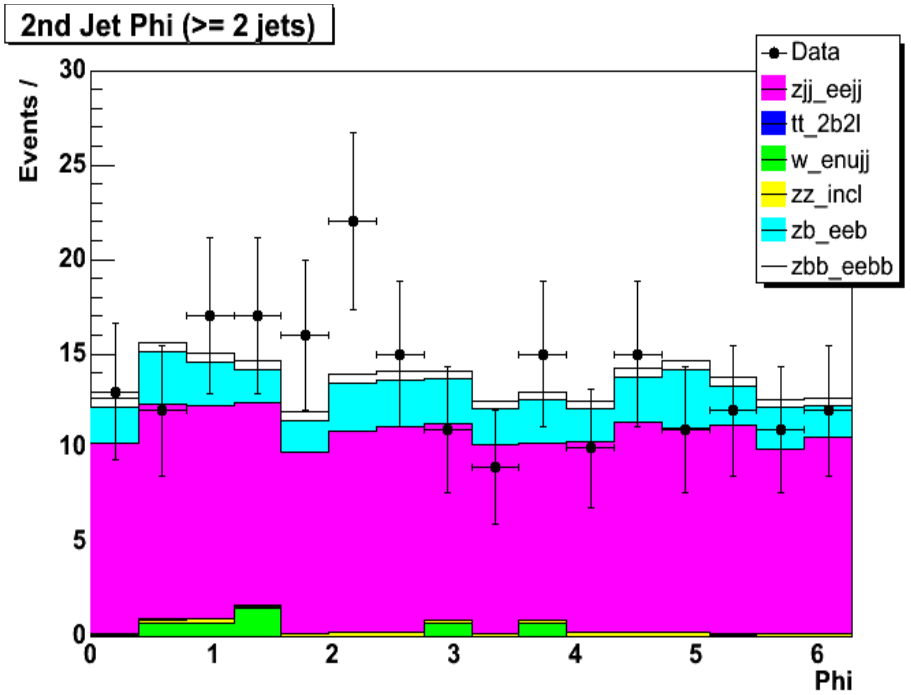

1st Jet Eta (>= 2 jets)
Events /
Eta
Data
zjj_eejj
tt_2b2l
w_enujj
zz_incl
zb_eeb
zbb_eebb


2nd Jet Eta (>= 2 jets)
Events /
Eta
Data
zjj_eejj
tt_2b2l
w_enujj
zz_incl
zb_eeb
zbb_eebb

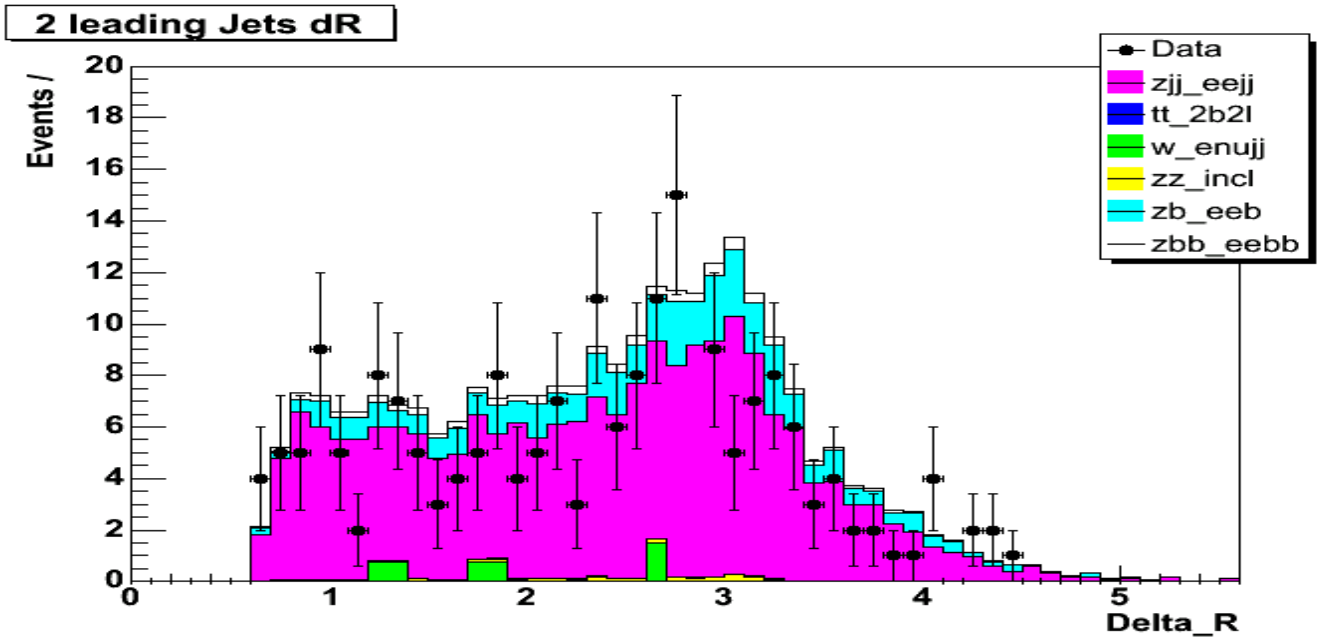
Jet Phi

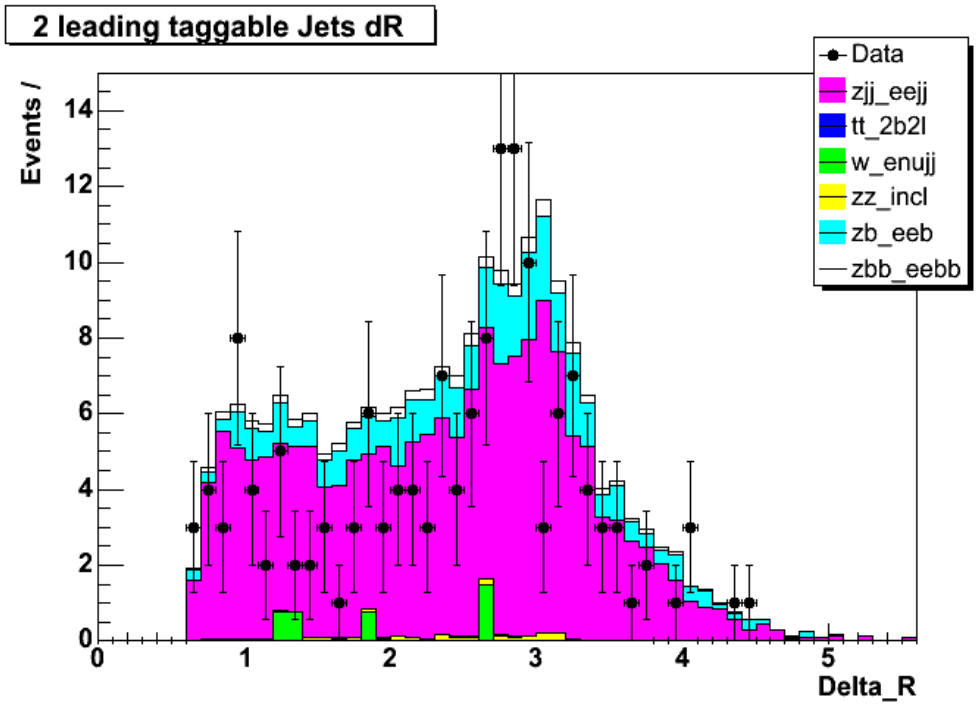

Jet Phi (>= 2 jets)
Events /
Phi
Data
zjj_eejj
tt_2b2l
w_enujj
zz_incl
zb_eeb
zbb_eebb

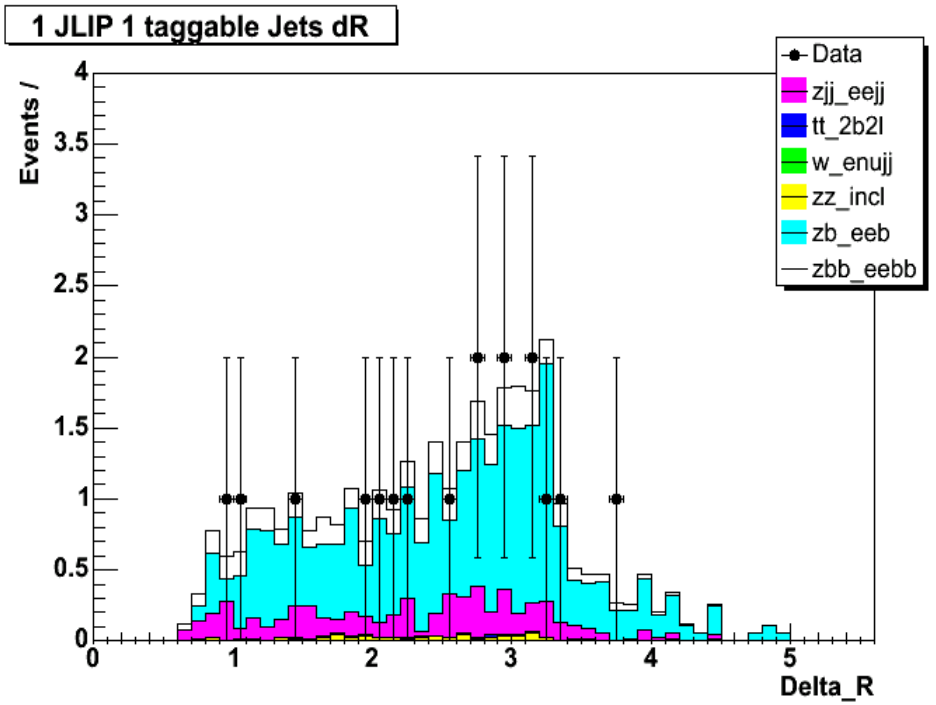

1st Jet Phi (>= 2 jets)
Events /
Phi
Data
zjj_eejj
tt_2b2l
w_enujj
zz_incl
zb_eeb
zbb_eebb


2nd Jet Phi (>= 2 jets)
Events /
Phi
Data
zjj_eejj
tt_2b2l
w_enujj
zz_incl
zb_eeb
zbb_eebb

Delta R between the two leading jets







Invariant Mass